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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/894,375	06/27/2001	Leonard Nanis	NANS 1000-2	5531

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EXAMINER	
MCDONALD, RODNEY GLENN	
ART UNIT	**PAPER NUMBER**
1753	

DATE MAILED: 11/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/894,375	NANIS, LEONARD
	Examiner	Art Unit
	Rodney G. McDonald	1753

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 October 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,10,13,14 and 33-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,10,13,14 and 33-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10-25-04*.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on October 25, 2004 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-7, 10, 13, 14 and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis (U.S. Pat. 5,405,646) in view of Suenaga et al. (U.S. Pat. 5,478,657).

Nanis teach in accordance with the present invention, FIG. 3, ***the aluminum alloy substrate (disk)*** is first degreased by organic solvents, as in the prior art. The substrate is then moved into a vacuum sputtering system designated by the dotted block. Vacuum sputter deposition systems are well known. Suffice to say that in such

systems the substrate is placed in an evacuated enclosure for processing. The first step is to further clean the surface by reverse sputter etching. In accordance with an embodiment of the invention, ***a first layer 16, FIG. 4, of material selected to bind with the aluminum surface is vacuum sputter deposited onto the surface. This is followed by vacuum sputter depositing a second layer 17 which serves as the nucleating layer for the subsequent electroless plating of a Ni--P layer.*** (Column 4 lines 47-61)

Pure chromium and pure titanium are preferred for the binder layer materials. Zirconium, vanadium, niobium, molybdenum, tantalum, tungsten and rhenium as well as alloy combinations of these elements may also be vacuum sputter deposited onto the aluminum disk as a first layer. The first (binder) layer covers the aluminum alloy and imbedded inclusions equally. This prevents the different behavior of these regions as occurs in the prior art process which relies on wet chemical processing only. (Column 4 lines 62-68; Column 5 lines 1-3)

The second vacuum sputter deposited thin layer is selected to: 1. bond tightly to the first layer; 2. further cover over inclusions; 3. resist oxidation during storage; 4. be insoluble in the electroless nickel solution; 5. nucleate the growth of electroless nickel; 6. bond tightly with electroless nickel; and 7. be nonmagnetic or selected that it does not interfere with the magnetic field produced by the read-write head. (Column 5 lines 4-11)

The most important requirements are the ability to nucleate Ni--P plating upon immersion in the electroless nickel bath and to provide non-magnetic

behavior. Pure nickel is an effective nucleating layer and, if the aluminum alloy surface is smooth, the growth of Ni--P will continue as a smooth surface. Pure cobalt, pure iron and mixtures of Co, Fe and Ni will also be effective nucleating materials. (Column 5 lines 12-17)

Although field calculations show ***that magnetic nickel may be used as the second layer, other non-magnetic materials may be deposited to nucleate Ni--P and satisfy all other requirements. Alloys of nickel mixed with amounts of alloy element sufficient to depress the Curie temperature to room temperature or below are suitable.*** (Column 5 lines 24-30)

Pure copper is non-magnetic and nucleates Ni--P growth from electroless nickel baths containing chloride ion and it also nucleates nickel-boron alloy from electroless nickel baths containing amino borane. ***Copper is thus an alternate second layer material. Pure palladium and pure platinum are also non-magnetic and can nucleate Ni--P deposition, and are suitable second layer materials. Alloy mixtures of nickel and copper are resistant to oxidation, as are also pure palladium and platinum, permitting storage without degradation of the surface after sputter deposition but before immersion in the electroless nickel tank. Alloys of copper with palladium and of copper with platinum are also suitable for the second layer. The Cu--Pd and Cu--Pt alloys may range within wide composition limits. Ternary mixtures of Cu, Pt and Pd in all proportions are also suitable second layer materials. In addition to palladium and platinum, second layer materials are pure gold, pure rhodium, pure osmium, pure ruthenium and pure rhenium. Alloys***

of said non-magnetic and Ni--P nucleating pure elements are also useful in binary combinations or multi-element mixtures over a substantially broad range of compositions. (Column 5 lines 39-61)

The remaining steps of the process are shown in FIG. 3 and are identical to the steps followed in the prior art FIG. 2. ***Wet chemical addition of Ni--P*** deposit is followed by polishing and the vacuum sputter deposition at chromium, magnetic cobalt alloy and carbon. (Column 6 lines 48-52)

As discussed and described above, ***the first and second layers cover the chemical non-uniformities and block their tendency to produce localized growth in advance of the main Ni--P deposit.*** In this way, the chemistry of the aluminum alloy has no effect on subsequent Ni--P deposition. Since the process covers over the chemical and metallurgical differences in the aluminum alloy, it may be possible to use less expensive alloy grades for which special treatments to remove intermetallic forming elements are not necessary. ***Also, glass, ceramic and polymeric substrates can be coated with Ni--P by this method.*** For example, the first layer may be chromium and titanium of which each bonds well to both glass, ceramic and plastic polymer materials. ***Other materials, such as lightweight titanium or magnesium alloys, can also be used as the substrate (disk).*** (Column 6 lines 53-68)

Figure 3 shows deposition of a chromium layer and deposition of a magnetic layer. (See Figure 3)

Figure 1 shows the substrate being treated on one side. (See Figure 1)

The difference between Nanis and the present claims is that the mechanical variations at or below the surface resulting from the smoothing process is not discussed and the level of smoothness of the substrate is not discussed.

Suenaga et al. teach ***an unplated titanium disc*** which is to be plated with a layer and useful ***for making a magnetic disk having a surface roughness, Ra***, defined as a mean height of the peaks from an imaginary center line on the surface, of said titanium disc just before plating ***of between 0.0002 micrometers and 0.0060 micrometers.*** (Column 9 lines 30-38) This roughness is achieved by polishing (i.e. smoothing) (Column 4 lines 19-20) (Inherently the disk has mechanical variation below the surface due to the polishing which is smoothing process.)

Both pure titanium and titanium alloys can be used as the substrate. (Column 3 lines 50-53)

The titanium plate or titanium alloy is ***cold-rolled***. (Column 4 lines 17-20)

The titanium plate can be plated with Ni-P. (Column 6 lines 49)

The motivation providing a substrate with a smooth surface roughness is that it allows it to be plated with a highly adhesive layer. (Column 2 lines 47-51)

As to the metal disk roughness, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by Suenaga et al. because overlapping ranges have been held to be a prima facie case of obviousness, see In re Malagari, 182 U.S.P.Q. 549.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Nanis by utilizing a metal substrate of titanium or titanium alloy having a particular surface roughness as taught by Ishitobi et al. because it allows for achieving a highly adhesive plated layer.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis in view of Suenaga et al. as applied to claims 1, 4-7, 10, 13, 14 and 33-35 above, and further in view of Ross et al. (U.S. Pat. 5,980,997).

The difference not yet discussed is that the nucleating layer being a sacrificial reactive metallic layer is not discussed.

Ross et al. teach a method in accordance with my invention comprises the step of depositing a smooth metallic layer on a glass substrate and texturing the metallic layer with a laser beam. The metallic layer is preferably impact resistant, hard and has a high melting temperature (e.g., greater than 1000.degree. C.). (Column 2 lines 11-16)

In a first embodiment, ***a metallic initiation layer is deposited on the glass substrate followed by electroless plating of NiP onto the initiation layer. The initiation layer is a material which facilitates electroless plating of NiP, such as Zn, Pd, Co, Fe, Rh, Be, NiP, Ni or alloys thereof.*** The initiation layer is formed because it is not possible to electroless plate NiP directly onto glass. After electroless plating, the NiP layer is then polished and laser textured. (Column 2 lines 17-24)

During one process in accordance with the first embodiment, ***the initiation layer is a thin Zn layer, and is formed by a zincate process. During this process, Al is deposited on the glass substrate, e.g. by sputtering, evaporation or other method.***

Thereafter, the substrate is subjected to the zincate process to form the Zn layer on the Al layer (the Al layer is typically either partly or completely consumed during the zincate process). A NiP layer is then plated onto the thin Zn layer, e.g. by electroless plating. The NiP layer is then polished and laser textured. Of importance, the thin Zn layer facilitates electroless plating of NiP, and the Al layer facilitates the formation of the Zn layer by the zincate process. (The zincate process does not work on bare glass.) In lieu of Al, other materials which can be subjected to a zincate process, e.g. Mg, can be used. (Column 2 lines 25-39)

In one variation of the first embodiment, ***an adhesion layer is deposited, e.g. by sputtering, on the glass substrate prior to depositing the Al layer.*** The adhesion layer causes the Al layer to strongly adhere to the substrate. ***The adhesion layer is typically Cr, Ta, Mo, W, V, Nb or alloys thereof.*** (Column 2 lines 40-44)

In a second embodiment, ***instead of using a Zn layer formed by the zincate process as the initiation layer, the initiation layer is formed on the substrate (or adhesion layer) by another process, e.g. sputtering or evaporation. The NiP layer is then formed on the substrate by electroless plating.*** (Column 2 lines 45-49)

Referring to FIG. 1A, a disk 110 includes a glass substrate 112, ***a Cr adhesion layer 114 and an Al layer 116 Substrate 112 is typically chemically strengthened borosilicate glass.*** Cr adhesion layer 114 is typically 5 to 50 nm thick (in one embodiment it is 20 nm thick) and is formed by sputtering at a rate of 4 nm/second at a power of 1 kw and a pressure of 6.5 mtorr in argon. In one embodiment, an Intevac 250 A sputtering system (manufactured by Intevac of Santa Clara, CA) is used to D.C.

magnetron sputter layers 114 and 116. Al layer 116 is typically 50 to 500 nm thick (in one embodiment 200 nm thick) and is also formed by sputtering, at a rate of 6.3 nm/second at a power of 1 kw and a pressure of 10 mtorr in argon. Cr layer 114 is optional, and is provided to ensure that subsequently deposited layers strongly adhere to glass substrate 112. Al layer 116 facilitates a subsequent zincate process. (Column 4 lines 40-55)

Referring to FIG. 1B, disk 110 is subjected to a zincate process, e.g. as described in the above-incorporated Lowenheim reference, to form a Zn initiation layer 117. Zn initiation layer 117 is typically about 5 to 10 nm thick. During this process, Al layer 116 is partially or completely consumed, depending on its thickness. (Column 4 lines 56-61)

In one embodiment, the substrate is subjected to a first zincate process, the resulting Zn layer is stripped off by dilute nitric and sulfuric acids, the substrate is subjected to a second zincate process, the resulting Zn layer is stripped off, and then the substrate is subjected to a third zincate process. These process steps result in formation of an improved NiP film (formed in a subsequent plating process, described below) with a finer NiP nodule structure, and a smoother NiP surface, but it is not presently clear why this is. In other embodiments, the zincate process is only performed twice. In yet other embodiments, the zincate process is only performed once. (Column 4 lines 62-68; Column 5 lines 1-6)

Referring to FIG. 1C, ***NiP layer 118 is deposited to a thickness between 5 and 10 microns, and typically about 8 microns, by electroless plating.*** (Column 5 lines 7-10)

In lieu of Cr as adhesion layer 114, other materials can be used, e.g. Ta, Mo, W, V or Nb,or alloy thereof. Alternatively, adhesion layer 114 can be omitted. (Column 6 lines 46-48)

In lieu of borosilicate glass, other glass compositions or materials such as silicon, SiC, ceramic, glass ceramic, or sintered carbon can be used as substrate 112. (Column 6 lines 54-56)

FIG. 3 illustrates a magnetic disk 150 during a manufacturing process in accordance with a second embodiment of my invention, ***including glass substrate 112 and optional Cr adhesion layer 114 as discussed above. However, in the embodiment of FIG. 3, a Zn initiation layer 115 is formed by a vacuum deposition process such as sputtering.*** When formed by sputtering, Zn layer 115 can be sputtered at a rate of 24 nm/second at a power of 1 kw and a pressure of 10 mtorr in argon. Zn layer 115 is typically 60 nm thick. (Column 6 lines 59-68)

Thereafter, NiP layer 118 is electroless plated onto Zn initiation layer 115. (Column 7 lines 1-2)

In lieu of Zn, other material s capable of initiating electroless plating can be used, e.g. Pd, Co, Fe, Rh, Be, NiP, Ni and alloys thereof. Such materials can be vacuum-deposited (e.g., by sputtering) either onto adhesion layer 114, or directly onto substrate 112. (Column 7 lines 8-12)

The motivation for utilizing a nucleating layer which is a sacrificial reactive metallic layer is that it allows facilitating electroless plating. (Column 2 line 20)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a nucleating layer which is a sacrificial reactive metallic layer as taught by Ross et al. because it allows for facilitating electroless plating.

Claims 2 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nanis in view of Suenaga et al. as applied to claims 1, 4-7, 10, 13, 14 and 33-35 above, and further in view of Ishitobi et al. (U.S. Pat. 6,152,976).

The difference not yet discussed is that that the roughness of the aluminum alloy substrate is not discussed.

Ishitobi et al. teach providing a disc substrate for magnetic recording which is polished with aqueous abrasive composition. The composition is advantageously utilized for polishing substrates made of a disc blank of aluminum or an aluminum alloy such an aluminum magnesium alloy. (Column 5 lines 34-40)

The substrate polished with the abrasive composition of the present invention have extremely minimized surface irregularities. The surface roughness is about 3 to 5 Angstroms and thus the smoothness is excellent. (Column 5 lines 49-53)

The motivation for utilizing a substrate of aluminum with a roughness of 3 to 5 angstroms is that it allows for providing a substrate that is capable of high recording density. (Column 2 lines 58-59)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Nanis by utilizing a specific roughness for the aluminum alloy substrate as taught by Ishitobi et al. because it allows for providing a substrate which is capable of high recording.

Response to Arguments

Applicant's arguments filed October 25, 2004 have been fully considered but they are not persuasive.

In response to the argument that Suenaga et al. teach away from Nanis '646 because Suenaga et al. teach depositing directly on the titanium substrate whereas Nanis '646 suggests utilizing an intermediate layer, it is argued that Nanis '646 teach the importance of having an intermediate layer between the substrate and the Ni-P layer (i.e. masking the first and second layers cover the chemical non-uniformities and block their tendency to produce localized growth in advance of the main Ni-P deposit) and therefore one would be motivated to include this layer between a substrate and deposited layers. Since Nanis '646 teach that a titanium substrate can be utilized one looking at Suenaga et al. would utilize Suenaga et al.'s titanium substrate in the process of Nanis '646 since Nanis '646 suggest utilizing titanium substrate in his process. (See Nanis '646 and Suenaga discussed above)

In response to the argument that Nanis '646 does not suggest masking the metallic microstructural variations that result from cold working to achieve super smooth surfaces on metallic substrates, it is argued that Nanis'646 teach depositing an intermediate layer between a substrate and a NiP layer. The purpose of this

intermediate layer is to mask chemical non-uniformities in the substrate. The substrates of Nanis '646 can include titanium substrates. Suenaga et al. suggest titanium substrates for magnetic disks. Suenaga et al.'s substrates include a surface roughness as well as a cold worked and polished surface which inherently includes mechanical microstructural variations. Therefore utilizing Suenaga et al's substrate in the process Nanis '646 would inherently achieve masking of the mechanical microstructural variations and one would look to Suenaga et al. for such a substrate since Nanis '646 recognize that titanium substrates can be utilized. (See Nanis '646 and Suenaga et al. discussed above)

APPLICANT'S DECLARATION:

Applicant's declaration has set forth arguments similar to those presented in the remarks and have been addressed above.

It is useful to note that Applicant recognizes at point 21 that Suenaga et al.'s disk substrate would include a Bielby layer and microstructural variations in the metal.

Applicant has also presented unexpected results showing that utilization of the intermediate layer is beneficial when not utilizing one. In response to this Nanis '646 already recognize the importance of this intermediate layer on a substrate. The substrate can be titanium. The secondary reference to Suenaga et al. teach utilizing a titanium substrate that is cold-rolled and polished for a disc substrate. Therefore, it would be obvious to utilize the substrate of Suenaga et al. in Nanis's process since Nanis recognize that titanium substrates can be utilized. (See Suenaga et al. and Nanis discussed above)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
November 8, 2004